

2 FIELD SAMPLING PLAN

2.1 Sampling Needs and Objectives

The remedial action sampling activities at the Glade Road facility (site) will be performed to provide data of sufficient quality and quantity to satisfy the following data quality objectives (DQOs):

- Confirm that the soils within the zone of groundwater fluctuation containing dinoseb concentrations greater than the site cleanup level have been effectively removed.
- Effectively monitor the natural attenuation of the dinoseb and nitrate in groundwater.

The sampling will supplement the previous testing conducted at the site.

2.2 Sample Locations

Two off-site soil borings will be drilled and sampled for soil identification, and for chemical analysis. Each of the borings will be completed as a groundwater monitoring well (MW-16 and MW-17), and groundwater samples will be collected from the planned wells and selected existing monitoring wells for chemical analysis. The locations of the planned and existing wells are shown on Figure 4 of the Work Plan.

A discrete soil sample will be collected from any sidewall of the soil excavation that does not consist of steel sheet piling. The samples will be collected at a depth of approximately 25 feet below ground surface (bgs).

Groundwater samples will be collected on a quarterly to annual basis from on-site shallow groundwater monitoring wells MW-3, MW-4, MW-8, and MW-14, and from off-site shallow monitoring wells MW-16 and MW-17. The locations of the wells are shown on Figure 4 of the Work Plan.

2.3 Sample Types, Frequency, and Analyses

2.3.1 Soil Samples

Subsurface soil samples will be collected from each soil boring at approximately 5-foot intervals, beginning at approximately 1 foot bgs. A selected sample from each boring, collected at a depth of less than 5 feet above the groundwater table, will be submitted to a laboratory [North Creek Analytical, Inc. (NCA) in Bothell, Washington] for chemical analysis.

Any soil sample collected from the soil excavation at the former wash pad area will be analyzed for chlorinated herbicides by EPA Method 8151A. The selected soil samples from the soil borings will be analyzed for nitrate by using EPA Method 300.0 and for chlorinated herbicides. The laboratory objectives for the chemical analyses are presented in Table 1. The laboratory deliverable requirements and the data validation parameters are presented in Tables 2 and 3, respectively.

2.3.2 Groundwater Samples

To verify the effectiveness of the asphalt caps, groundwater samples will be collected on an annual basis from on-site monitoring wells MW-4 and MW-14 for a period of at least 5 years. The samples will be submitted to NCA for analysis of nitrate by using EPA Method 300.0 and chlorinated herbicides by using EPA Method 8151A.

To monitor the attenuation of the dinoseb concentrations, groundwater samples will be collected on a semi-annual to quarterly basis from on-site monitoring wells MW-3 and MW-8 and from off-site monitoring well MW-16. The samples will be submitted to NCA for analysis of chlorinated herbicides.

To monitor the attenuation of the nitrate concentrations, groundwater samples will be collected from on-site monitoring wells MW-4 and MW-14 and off-site monitoring wells MW-16 and MW-17 on a semi-annual to quarterly basis. The samples will be submitted to NCA for analysis of nitrate. The groundwater sampling schedule is described in the Work Plan.

2.3.3 Field Quality Assurance

Field quality assurance (QA) will be maintained through compliance with the SAP, collection of duplicate samples, and documentation of sample plan alterations. Duplicate samples will be collected at a frequency of up to 10 percent of the total number of groundwater samples.

2.4 Sample Designation

Soil samples will be identified by the boring or excavation sidewall from which they are collected, and groundwater samples will be identified by the monitoring well from which they are collected. The soil boring samples will be identified by the soil boring number and the sample depth. For example, the sample collected from boring SB-17, at a depth of 20 feet, would be designated "SB-17-20". The sidewall samples from the excavation will be identified by the sidewall name (direction), sequential sample number, and the sample depth. For example, the first sample collected from the southern sidewall, at a depth of 25 feet, would be designated "SSW-1-25". The groundwater samples will be identified by the monitoring well name and date. For example, the groundwater sample collected from well MW-4 in August 2004 would be designated "MW-4-0804"

QA samples (field duplicates) will be submitted blind (i.e., not identified as QA samples) to the laboratory. The QA samples, samples will be labeled with a fictitious sample name (e.g., a non-existent sampling location). Trip blanks will be identified with sequential sample number and a date suffix (e.g., TB-1-0804) on the container. Extra samples collected for laboratory duplicates and matrix spike and matrix spike duplicate (MS/MSD) analyses will be identified with the same designation as the sample.

2.5 Drilling and Soil Sampling Procedures

2.5.1 Utility Location

All drilling locations will be checked for underground utilities prior to the start of drilling. Boring locations may be moved due to underground or aboveground utilities. The field geologist may approve relocations within 25 feet of the original site and will notify the environmental contractor's project manager. Relocations greater than 25 feet from the original boring location will require approval by both the environmental contractor's project manager and Ecology before drilling commences.

2.5.2 Drilling Procedures

All soil borings will be drilled by using a hollow-stem-auger drilling rig equipped with 8-inch inside-diameter (i.d.) casing and a bit. All downhole drilling equipment will be decontaminated prior to use and between drilling locations as described in Section 2.12. If water must be added to the borings to control heaving conditions, only potable water will be used. All residual soil and water collected during drilling and sampling will be handled and disposed of following the procedures described in Section 2.13. The monitoring wells will be completed as described below.

2.5.3 Soil Sampling

Subsurface soil samples will be collected at 5-foot intervals from both soil borings. Soil samples will be collected at the designated intervals in advance of the drill bit by using an 18-inch-long, 2-inch-diameter split-spoon sampler. Table 4 includes a list of the equipment that will be used for the soil sampling activities. A summary of the soil sampling procedures is listed below.

- A. All sampling equipment and reusable materials that will contact the sample will be decontaminated on site in accordance with procedures identified in Section 2.12. The field geologist will use clean neoprene or vinyl gloves for handling each sample.
- B. The sample container labels will be filled out and attached to the appropriate containers as described in Section 2.10.
- C. Soil samples for chemical analysis will be collected from both borings. The samples will be transferred directly from the sampler into the sample containers. A clean stainless-steel spoon will be used to collect soil from along the length of the split spoon. To protect the sample from possible contamination during handling, the split-spoon sampler will be placed on a clean piece of plastic sheeting. All subsequent handling of the sample will take place over the plastic sheeting.
- D. One 8-ounce glass jar will be filled at each sample interval if sample volume permits. Soil will be transferred directly from the split spoon sampler to the sample containers. Care will be taken to minimize disturbance of soil placed in the containers. Each container will be filled as full as possible to minimize headspace.
- E. After filling the 8-ounce sample jars, the remaining sample will be logged on a Boring Log Form (Figure 1) using the United Soil Classification System. A soil description based on the United Soil Classification System is shown on Figure 2.
- F. Samples submitted for duplicate chemical analysis will be collected by using the procedures described above. Samples will be blind labeled when submitted to the lab.
- G. After filling, the sample container(s) will be placed on ice in a cooler and handled as described in Section 2.10. The sample coolers will be sent to the laboratory within 12 hours of sampling.

2.6 Monitoring Well Installation and Development

Two shallow groundwater monitoring wells will be installed to the west of the site. The wells will be constructed so that the screens straddle the groundwater table. All monitoring wells will be installed in accordance with the requirements of Chapter 173-160 WAC, Part 3, "Resource Protection Well Guidelines." The wells will be constructed of 2-inch-i.d. flush-threaded Schedule 40 PVC, including a threaded end plug (Figure 3). The wells will be constructed using a 10-foot-long screen with machined 0.010-inch slots. At higher ground surface elevations (MW-16), the monitoring well screen will be placed across the water table from approximately 20 to 30 feet bgs. At lower ground surface elevations (MW-17), the monitoring well screen will be placed across the water table at approximately 15 to 25 feet bgs.

The annular space around the screen zone of each monitoring well will be backfilled with clean Colorado 10-20 silica sand. This filter pack will extend from approximately 2 to 12 inches below the lowest slot to at least 2 feet above the uppermost slot. The annular space above the filter pack will be sealed with 3/8-inch (medium) bentonite chips that are hydrated with potable water. The bentonite seal will extend from the top of the filter pack to the base of the surface security casing in all monitoring wells.

All annular space materials will be placed concurrent with casing withdrawal. As-built construction details, including the volumes of materials used to construct each well, will be recorded on the boring log. The total depth of each boring and the placement depths of the filter pack, the bentonite seal, and the surface completion will be measured to the nearest 0.1 foot, using a weighted fiberglass tape.

The top of each well will be secured with an above-ground lockable security casing (Figure 3). Above-ground security casings will be cemented in place, with the surface of the cement sloping away from the security casing.

The newly installed wells will be developed by pumping, surging, or bailing. The water level in the well will be measured to the nearest 0.01 foot (from the north side of the well casing) before development by using an electric water level probe. Water depths will be recorded on a Groundwater Sampling Data Sheet (Figure 5) and will include date, time, and developer's initials. The total pore (casing) volume of the installation will be determined using the measured water level and the as-built installation depth. Groundwater pH, specific conductance, and temperature, may be measured during development. A well will be considered developed when at least ten times the pore volume of water has been removed from the well, and the color of the discharge water does not change with additional development. If after one hour of development the discharge water does not clear, then no further development will be attempted and the suitability of sampling groundwater from the well will be evaluated by the environmental contractor's project manager.

Well development details, including discharge volume, discharge rate, pH, specific conductance, temperature, and appearance will be recorded on a Groundwater Sampling Data Sheet. All development water will be handled as described in Section 2.13.

2.7 Excavation Soil Sampling

2.7.1 Soil Sampling Procedures

During the excavations the prime environmental contractor will record the excavation dimensions, the types of soil encountered, the depths of sample collection, and the depth to groundwater, if present, on an Excavation Log (Figure 4). Soil samples will be collected from the sidewalls of the excavation that do not consist of sheet piling by using the backhoe bucket (construction contractor). The environmental contractor will transfer the soil from the bucket to laboratory-prepared containers by using a clean stainless-steel spoon. Exact sample locations will be based on field screening (odors and visual appearance) results.

Table 4 (Field Equipment and Supplies) includes a list of equipment to be used for soil sampling activities. A summary of the soil sampling procedures as listed below:

- All sampling equipment and reusable materials that contact the sample will be decontaminated on site consistent with procedures identified in Section 2.12.
- The sample container labels will be filled out and attached to the appropriate containers as described in Section 2.10.
- Soil from the backhoe bucket will be transferred directly into the sample jars by using a clean stainless steel spoon.
- The sample will be logged on an Excavation Log (Figure 4) or in a field notebook.
- After being filled, the sample container(s) will be placed in a cooler with ice and handled as described in Section 2.10. The sample coolers will be shipped to the laboratory within 48 hours of sampling.

2.8 Groundwater Sampling Procedures

The groundwater in selected on-site and off-site shallow monitoring wells will be sampled using new disposable PVC bailers. The groundwater sampling events will be conducted in accordance with the schedule described in the Work Plan. The groundwater sampling procedures include the following:

- A. The depth to groundwater will be measured in the well before sampling. The water level will be measured to the nearest 0.01 foot from a surveyed notch in the well casing by using an electric water level probe. Water depths will be recorded on a Groundwater Sampling Data Sheet, and will include date, time, and sampler's initials.
- B. The monitoring wells will be purged with a new disposable PVC bailer. During purging, the temperature, pH, and specific conductance of the extracted water will be measured with a thermometer and a pH/conductivity meter, respectively, and recorded after the removal of each well casing volume. Parameters must stabilize to within a 10 percent difference between consecutive pore volume removals prior to obtaining a sample. Measurements will be recorded to the following standards:
- Temperature to $\pm 0.5^{\circ}\text{C}$
 - pH to ± 0.1 units
 - Specific conductance to $\pm 1 \mu\text{S/cm}$
- C. The pH/conductivity meter will be calibrated before measurements are taken and approximately every four hours thereafter.
- D. No less than three well casing volumes will be purged before collecting groundwater samples. After at least three pore volumes have been purged and the field parameters have stabilized, final measurements of temperature, pH, and specific conductance will be obtained and recorded. Residuals will be managed as described in Section 2.13.
- E. Each sample will be collected with a new disposable PVC bailer. All samples will be transferred in the field from the sampling equipment to a laboratory-prepared container.
- F. Samples will be labeled, handled, and shipped by using the procedures described in Section 2.10. Sample custody will be maintained until delivery to the analytical laboratory. All sampling field activity and data will be recorded on a Groundwater Sampling Data Sheet (Figure 5).
- G. QA samples will be collected at the frequency described in Section 2.3.3. Duplicate samples will be collected by alternately filling like containers until both containers are filled.
- H. The sampler(s) will wear new neoprene or vinyl gloves at each sample location. New bailer cord (monofilament nylon) will be used at each sample location.

- I. All reusable purging and sampling equipment will be decontaminated by using the procedures described in Section 2.12.

2.9 Sample Procedure Alterations

Any deviations from the general sampling procedures presented here will be brought to the attention of the environmental contractor's project manager, and a Sample Alteration Checklist will be completed (Figure 6).

2.10 Sample Labeling, Shipping, and Chain-of-custody

Sample Labeling. Sample container labels will be completed immediately before or immediately after sample collection. Container labels will include the following information:

- Project name and project number
- Sample number
- Name of collector
- Date and time of collection
- Analyses requested

Sample Shipping. Sample containers will be transported in a sealed, iced cooler. In each shipping container, glass bottles will be separated by a shock-absorbing and absorbent material to prevent breakage and leakage. Ice or "blue ice," sealed in separate plastic bags, will be placed into each cooler with the samples. All sample shipments will be accompanied by a Chain-of-Custody Form (Figure 7). The completed form will be sealed in a plastic bag and taped to the inside lid of the shipping container. Signed and dated chain-of-custody seals will be placed on all shipping containers. The name and address of the analytical laboratory and the environmental contractor's name and office (return) address will be placed on each shipping container prior to shipping.

Chain-of-Custody. Once a sample is collected, it will remain in the custody of the sampler or other the environmental contractor's personnel until shipment to the laboratory. Upon transfer of sample containers to subsequent custodians, a Chain-of-Custody (Figure 7) will be signed by each person transferring custody of the sample container. A signed and dated chain-of-custody seal will be placed on each cooler prior to shipping. Upon receipt of samples at the laboratory, the cooler seal will be broken and the

condition of the samples will be recorded by the receiver. Chain-of-custody records will be included in the analytical report prepared by the laboratory.

2.11 Surveying

The locations of off-site monitoring wells MW-16 and MW-17 will be surveyed by a licensed surveyor. Each well will be surveyed for ground surface elevation (to the nearest 0.1 foot), horizontal position (to the nearest 1.0 foot), and well casing rim elevation (to the nearest 0.01 foot). Unless otherwise specified, the north side of the well casing rim will be surveyed. The ground surface and well casing rim elevations will be surveyed relative to mean sea level. The horizontal position of the wells will be measured relative to site structures or county roads.

The lateral and vertical extents of the soil excavation will be surveyed by a licensed surveyor. The lateral extents will be measured every 20 feet relative to site structures or county roads. The inside of the excavation will be surveyed for horizontal position and for depth bgs.

2.12 Decontamination Procedures

A decontamination area will be established for cleaning the drilling rig, excavation equipment, and soil sampling equipment. All down-hole drilling equipment will be steam-cleaned or hot water pressure-washed prior to beginning drilling and between drilling each boring. Split spoon samplers, spoons, and other sampling equipment that will contact samples will be decontaminated prior to initial use, between sampling locations, and between different sampling depths at the same location. Soil sampling equipment will be decontaminated by steam cleaning, hot water pressure washing, or by the following procedure:

- Tap water rinse
- Non-phosphatic detergent (Liquinox) and tap water wash
- Tap water rinse
- Dilute nitric acid rinse ($\text{pH} < 2$) at the start of each day and if the split-spoon sampler or sampling spoons are visibly rusty
- Distilled water rinse

All groundwater sampling equipment (bailer and cord) will be disposed after collecting each sample. The water level probe will be rinsed with distilled water between uses in

different monitoring wells. All well casings and screens will be steam-cleaned or hot water pressure-washed before installation. All labels and binding tape will be removed from well materials prior to steam cleaning or washing. Decontamination of personnel involved in sampling activities will be accomplished as described in the Health and Safety Plan (Appendix B of Work Plan).

2.13 Residuals Management

All residual soil, water, and decontamination solutions will be handled appropriately. Used disposable clothing and equipment will be placed in plastic bags and disposed of as solid waste. Appropriate personal protective clothing will be worn during the transfer of residuals to protect against potential skin contact and splash hazards.

All soil generated during drilling will be placed in properly labeled, 55-gallon drums. Water generated from development, sampling, and decontamination will be placed in properly labeled, 55-gallon drums that are separate from the soil drums. The drums will be labeled with the date filled and a description of the contents (including approximate quantity). The drums will be sealed and secured. All of the drums will be stored at an on-site holding area until they are transferred off site for disposal.

The excavated soils will be temporarily stockpiled on site. The stockpile of the soil excavated from depths within the zone of groundwater fluctuation (25 to 29 feet bgs) will be hauled off site for disposal. The stockpile of the soil excavated from depths of less than 25 feet bgs will be used to backfill the excavation.

A record of all generated residuals will be maintained to expedite characterization and disposal upon completion of field activities. Western Farm Service (WFS) will be responsible for the proper disposal of all wastes. The environmental contractor will coordinate with WFS for appropriate disposal procedures.